

IV.—*On Chilostomatous Characters in Meliceritidæ and other Fossil Bryozoa.* By ARTHUR WM. WATERS.

[Plate VI.]

I HAVE on various occasions * pointed out that the Meliceritidæ have avicularia, and have also written to several friends who were at work upon the Chalk fossils with the hope that the relationship of this group would be thoroughly worked out. Mr. Vine, however, in his recent 'British Association Report,' and Dr. Pergens, in his revision of d'Orbigny's 'Cretaceous Bryozoa,' place them with the Cyclostomata without indicating any doubt as to the position; and it may therefore be well to again call attention to some of the characters of the group.

When d'Orbigny wrote, "cellules accessoires" was a convenient term, as but little was known about avicularia; and in this family they are sometimes called "cellules accessoires," sometimes "cellules ovariennes;" but it must be borne in mind that also in *Onychocella* and its allies d'Orbigny did not understand the function of the vicarious avicularia, which he called "cellules accessoires," and speculated that since they occur on the same zoaria as ovicells this could not be their function, but might they be male cells? Pergens, Marsson †, and others, however, follow, and speak of triangular ovicells. It is surprising that d'Orbigny should have called the organs figured on plate 736. fig. 6, and plate 735. fig. 15, 'Paléontologie Française,' ovicells, as they are so decidedly avicularian in shape; but as this is perhaps even more marked in a specimen of *Melicerites semiclausula*, d'Orb., in my collection, from Le Mans figures (1 and 8) are given. The presence of a spatulate mandible is distinctly indicated, and there can be little doubt that we have before us a vicarious avicularium. In some cases the end of the mandible has been unsymmetrical (fig. 8), similar abnormalities not being unfrequent in recent vicarious avicularia.

In *M. royana*, W. (fig. 2), there are also avicularia scattered over the surface, and here again, if we are to judge by analogy, we can scarcely doubt that in the beak there has been a chitinous mandible. The opening of the avicularium

* Quart. Journ. Geol. Soc. vol. xl. p. 679; &c.

† Marsson ('Die Bryozoen der weissen Schreiekreide der Insel Rügen,' p. 47) makes *Nodellea* a genus of the family Eleidea, based simply upon its having a special ovicell: but his figure of *Nodellea propinqua*, Mars., shows an undoubted avicularium and no ovicell.

differs somewhat from any with which I am acquainted, but nevertheless reminds us of avicularia and not at all of ovicells.

In *M. cenomana*, d'Orb., there are some large broken-down cells which I should be inclined to consider avicularian; but as the preservation of the specimen is unsatisfactory, this must remain uncertain. There is in another part an inflation round which the zoecia are irregularly grouped; above the lower central zoecium there is a semicircular depression with a few perforations, giving it the appearance of an "arca" like those found in the ovicells of so many *Cellepore* &c. I hope that this may receive further investigation from some one possessing better specimens.

Finding a character so distinctly Chilostomatous as avicularia, it is necessary to examine more carefully the others; and first, as to those on the surface, the front is punctate, with larger pores than those of the Cyclostomata. These have been overlooked, as the fossilization of Cretaceous forms makes it often impossible and usually very difficult to distinguish such surface-markings; but in sections they are readily seen. In figure 2 they are shown all over the surface, though, as a matter of fact, they can only be distinguished in a few zoecia.

Over the aperture of some zoecia there is a thin calcareous plate, but in others there is at a lower level a very peculiar partial closure, formed by three, or sometimes four, calcareous growths, starting from the side and uniting in the centre.

We thus find externally points which indicate that we are not dealing with a simple Cyclostomata, and examination of the interior structure is quite as convincing on this point. In transverse sections (figs. 5 and 11) a contraction formed by a curved plate is seen on each side just below the opening. Possibly an operculum has an attachment here, but of this I have not been able to satisfy myself. In longitudinal sections (fig. 4) there is also a projecting plate just behind the front wall; and although I am not acquainted with exactly similar contractions in any Chilostomata, they seem to indicate Chilostomatous affinities, and nothing of the kind is known in the simple tubular Cyclostomata. The central portion of the zoarium, however, consists of parallel plain tubes, and certainly this portion resembles the structure of many Cyclostomata. The lateral walls of the zoecia in the wider part and also at the commencement of the tubular portion show the beaded structure * which I have described in *Heteropora*

* "On the Occurrence of Recent *Heteropora*," Journ. Roy. Micr. Soc. vol. ii. p. 390.

and other species of Cyclostomata, caused by the walls being thinner where the perforations occur.

Dr. Hann* placed the Melicertitidæ as a third "typus" (the Stigmatoporina) of the Inarticulata, a "tribus" of the Cyclostomata, on account of the mode of growth, namely the zoecia terminating at right angles to a central bundle of long parallel tubes. Marsson† divides the Cyclostomata into typus Solenoporina and typus Metopoporina, the last including the families Ceidea, d'Orb., and Eleidea, d'Orb. Pergens‡ makes a typus Melicertitina. Each of these workers calls attention to the trumpet-like dilation of the extremity of the zoecia, but all speak of the triangular ovicell, though if we are to be guided at all by analogy there is no reason for speaking of an ovicell, whereas the resemblance to many undoubted vicarious avicularia is most striking, for there is evidently the platform for a triangular or spatulate chitinous appendage.

Before we can be sure of the position of this division, or perhaps suborder, the whole group must be reexamined, as probably some of the forms placed here by d'Orbigny should simply be removed to Chilostomata, others remaining with the Cyclostomata, leaving a division which should be carefully compared with some of the older forms, and perhaps some Palæozoic fossils will be elucidated thereby.

To come to the second part of the paper, E. O. Ulrich§ has recently published an important work on the Palæozoic Bryozoa of Illinois, and considers that the suborder Cryptostomata of Vine shows relationship with the Chilostomata; and this publication has induced me to put together the above results, which, like many other fresh facts, have been among my notes for many years. Ulrich lays great stress upon two projecting processes in the interior of the Cryptostomata, which I pointed out as existing in a species of Fenestellidæ|| and which Ulrich now calls hemisepta. These are usually at the base of what Vine and Ulrich call a vestibule; that is to say, there is within the shell a tubular shaft up to the external opening, so that it is at right angles to the "primary chamber," which might be called the zoecial chamber. No explanation is attempted of the function of the hemisepta; but there are a great many recent species in which there is a similar vestibule, at the base of which is the oral aperture

* 'Die Bryozoen des Mastrichter Ober Senon.'

† 'Die Bryozoen der weissen Schreiekreide der Insel Rügen,' p. 7.

‡ "Revision des Bryozoaires du Crétacé figurés par d'Orbigny," Bull. Soc. Belge de Géol. vol. iii.

§ "Palæozoic Bryozoa," Palæontology of Illinois, vol. viii., 1890.

|| "Remarks on some Fenestellidæ," Manchester Geol. Soc. vol. xiv., 1878.

closed by an operculum, and all above this is the equivalent of the peristome. In recent forms a better name is required, so that it can be applied whether there is a projection above the zoarium or not.

This vestibule may be well seen in my figure * of *Adeonella atlantica*, B., which should be compared with some of Ulrich's. It also occurs in *Porina* and very well marked in *Schizoporella challengeria*, Waters†; other numerous instances could be given of the same thing in recent and fossil species. At the oral aperture there is often a small calcareous projection for the attachment of the operculum, which in *Schizoporella challengeria*, W., is so distinct that it may well be called a hemiseptum; and a similar projection is figured in *Bifaxaria denticulata*, B.‡

Many of Ulrich's figures remind us very closely of the structure in recent forms; but there are also several with a series of hemisepta, and it is very difficult to understand what these may mean, so that we may withhold judgment as to whether all that are grouped under Cryptostomata will prove to form a suborder. On the other hand, there seems good reason for thinking that a large number of Palæozoic forms previously placed with Cyclostomata really show greater affinities with Chilostomata.

Since Mr. Ulrich's paper was written I have recorded the fact that in Chilostomata there may be a closure exactly resembling that known in several Cyclostomata, and that it may exist above the oral (opercular) aperture§. Closures are known in many of the Palæozoic fossils; but these Mr. Ulrich calls opercula, a use of the term against which I must strongly protest, as "opercula" should only mean the movable chitinous cover as known in the Chilostomata. These closures seemed formerly to indicate relationship with the Cyclostomata, but now, knowing them in the other suborder, their presence cannot be considered to weigh against Mr. Ulrich's views.

Melicertites royana, sp. n.
(Pl. VI. figs. 2, 4, 5, 6, 11.)

D'Orbigny described *Multinodelea tuberosa* from several localities in the French Senonian, and among others from

* Supp. Chall. Rep. pl. ii. fig. 20.

† *Loc. cit.* pl. ii. fig. 25.

‡ *Loc. cit.* pl. ii. fig. 31.

§ "North Italian Bryozoa," Quart. Journ. Geol. Soc. vol. xlvii. p. 5 &c., pl. iii. fig. 4.

Royan, near Bordeaux ; but it would seem that he had more than one species before him, as the avicularia figured are not all the same. Those, however, that I collected in Royan have an avicularium differing from any figured by d'Orbigny, and therefore it seems necessary to describe it as a new species for the purpose of identification.

The avicularia sometimes occur in transverse rows, at other times irregularly distributed. The proximal portion of the avicularium has a plate, which is but slightly depressed ; the distal end is much more depressed, with an opening at the lower part and a median slit ; the end of the beak is raised. The closures referred to seem to be constant in shape, starting from the base and two sides, joining in the middle ; but sometimes they start from four points. The contraction below the aperture is described on page 49.

A genus *Multinodelea* was created by d'Orbigny for a form consisting of more than one layer ; but I found many specimens, some with and some without superimposed layers, and quite agree with Pergens that *Elea* and *Nodelea* must be placed in one genus. One section shows four superimposed layers, and it is very curious to see how these layers grow, for here (see fig. 4) the aperture is closed by a plate, and from this one wall of the tube forming the fresh zoëcium grows. As to the meaning of this extraordinary origin of the new zoëcia I would not attempt an explanation.

Meliceritites semiclausula, d'Orb.

(Pl. VI. figs. 1 and 8.)

Meliceritites semiclausula, d'Orb., Pal. Fr. p. 619, pl. 618. figs. 6-10, pl. 736. fig. 16.

This species was described by d'Orbigny from Le Mans as having no "cellules accessoires ;" and if he had seen the avicularia it would have been placed with *Nodelea*, showing how artificial the division was. In my specimen from Le Mans the beak of the avicularium is large and expanded at the end, sometimes unsymmetrically so. The front wall of the zoëcia has large pores.

Although calling attention to various points of structure, I am not able to fix the limits of the Meliceritidæ ; nor is the object of the communication to pronounce an opinion as to whether all the fossils described by Mr. Ulrich are Bryozoa, or whether some of the forms may not have to be removed from or to Cryptostomata ; but there can be no doubt that

Mr. Ulrich, by giving figures of so many sections and pointing out fresh and important characters, has done work which will lead to a juster appreciation of the position of Palæozoic Bryozoa. I would urge the importance of a thorough comparison of Palæozoic with Cretaceous genera, for the number of known Cretaceous genera is very large, and with these and the present fauna comparison can be made, thus giving the best stepping-stone between the rich Carboniferous fauna and the recent.

I would like to ask why *Streblotrypa Nicklesi*, Ulrich, pl. lxxi. fig. 9, should be separated from *Petalopora**, and there are other genera which do not seem altogether new. Should not *Worthenopora* be *Micropora*?

In conclusion, in the Cretaceous Melicertitidæ the characters are in the main Chilostomatous united with some that are Cyclostomatous, and also in a very large section of Palæozoic fossils there are important structures similar to those in recent Chilostomata.

EXPLANATION OF PLATE VI.

- Fig. 1. *Melicertites semiclausula*, d'Orb. From Le Mans. Magnified 25 times.
 Fig. 2. *Melicertites royana*, sp. n. Mag. 25 times.
 Fig. 3. *Melicertites cenomana*, d'Orb. From Le Mans. Mag. 25 times.
 Fig. 4. *Melicertites royana*, sp. n. Longitudinal section. Mag. 25 times.
 Fig. 5. The same. Transverse section. Mag. 25 times.
 Fig. 6. The same. Tangential section. Mag. 25 times. The upper portion is cut through nearer the surface than is the case in the lower part.
 Fig. 7. (*Escharella argus*, d'Orb.) Mag. 25 times. From Maestricht. Showing a vicarious avicularium with an opening somewhat different from any yet described.
 Fig. 8. Avicularium of *Melicertites semiclausula*, d'Orb. Mag. 25 times.
 Fig. 9. (*Nodelea transversa*, d'Orb.) Avicularium copied from d'Orbigny, Pal. Fr. pl. 736. fig. 6.
 Fig. 10. (*Nodelea ornata*, d'Orb.) Avicularium copied from d'Orbigny, loc. cit. pl. 735. fig. 14.
 Fig. 11. *Melicertites royana*, sp. n. Transverse section. Mag. 50 times.

V.—New Scarabæidæ in the British Museum: a Fifth Contribution. By CHARLES O. WATERHOUSE.

[Concluded from vol. vii. p. 522.]

LITOCOPRIS, gen. nov.

I propose this name for a certain number of small species of *Coprins* which differ from the ordinary forms in being more regularly oval; the clypeus is broadly and not deeply

* *Cavea*, d'Orb.